

TRANSIENT IMPACT OF SHELLS BASED ON A THREE-DIMENSIONAL FORMULATION

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This study aims at a computational approach for transient impact of shell structures, being a frequent problem in large deformation analysis with a great variety of different application areas. Often these applications come along with the need to use complicated material models wherefore a strong desire to use three-dimensional shell formulation exists. In addition, the contact scenario also asks for such a truly three-dimensional description. Special aspect of the talk will be the contact formulation for a three-dimensional shell description [2]–[5] still utilizing a two-dimensional mid-surface representation. The discretization is based on a hybrid strain/displacement formulation. The general case of large deformation with large sliding frictional contact is considered. The approach introduced in [7],[8], which is virtually free of any limitations concerning the type of discretization and constitutive response is adopted and applied to nonlinear analyses of shells with contact interfaces.

However the discretization of a three dimensional thin-walled body with two-dimensional description of the mid-surface and a director field introduces additional sophistication into both contact formulation and search algorithm [1]. For the treatment of contact constraints different techniques, namely the penalty and augmented Lagrangean methods are resorted to. Additionally for the special case of two-dimensional frictionless problems the stability of the computation in implicit dynamics is considered within an energy-momentum conserving framework. Here the equilibrium along the contact interface is enforced at the mid-configuration which is in compliance with the basic conserving algorithm [7].

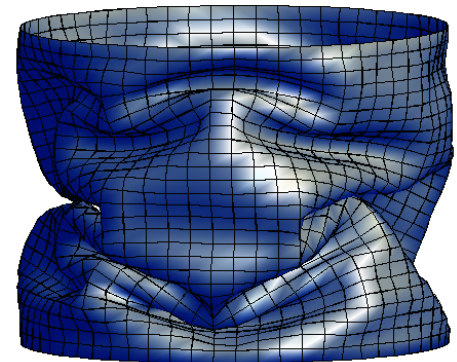


Fig. 1: Buckling of a cylinder

Thereby this work combines three in itself challenging fields of computational mechanics, namely nonlinear shell dynamics, computational contact mechanics and conserving time integration schemes. All of these topics have been active fields of research of M. A. Crisfield –with numerous original contributions– to whom this Minisymposium and the current presentation is devoted.

References

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